R/D 6101-MS-01-1

(2)

Modification of the Elstomer Test Machine

Contract No. DAJA 45-88-C-C-0038

FIRST INTERIM REPORT

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8th December, 1988

Elastomer Test Machine (ETM) Modification Programme

1 Introduction

The machine has been designed and constructed with the funding provided by the U.S. Army - E.R.O. Office (London), Contract No. DAJA 45-85C-0044. During the trial and testing of materials for tyre pads with this machine several difficulties were observed and it was agreed that the following modifications should be incorporated in the existing machine to improve its performance and usefulness.

(i) Synchronisation of the Linear Table with the Press Action of the Ram.
(ii) Measurement of Horizontal Force on the sample.
(iii) Slip-Ring System for Measurement and Control of Temperature.
(iv) On-site Weighing of Sample.
(v) Computer control of ETM

An extension of the above contract for a further period of twelve months was granted to the Principal Investigator and UCNW (your reference: DAJA45-88-C-C-0038) on 13 September 1988 to complete the proposed modification.

2. Progress to Date

(i) Synchronisation of Linear Table with Press Ram Stroke with Reference to Fig. 1.

Synchronisation is achieved by installing a dummy cylinder with its magnetic piston coupled to the linear table.

Linear movement of the table will then move this piston whereby its inbuilt magnet will activate proximity switches set at any selected positions within range of travel. The two proximity switches will in turn control power to energise the solenoid operated pneumatic valves to lower/raise the press ram.

This arrangement will, therefore, directly couple the sample's linear position with the point of entry and withdrawal of the Ram/Tool bit.

(ii) Measurement of Horizontal Force in Sample With Reference to Fig. 2.

Two further load cells will be incorporated in a modified tool bit holder in the press ram positioned as shown in the fig 2. With the positions indicated in figure 2, when the tool bit is embedded in a sample and with linear movement applied in either direction, the sample resistance will be transmitted directly to each load cell.

(iii) Measurement and Control of Sample Temperature

Two forms of effective modification to improve temperature control are being considered:-

A) Slip Ring Assembly

The machined brass sliprings transmitting the thermocouple voltage to the eurotherm temperature controller will be silver plated and the associated brushes will be of silver graphite.

This arrangement will ensure a more accurate transmission of the very small voltages involved and subsequently less erratic behaviour of the controller to give more accurate temperature control.

B) A Non-contact System of Temperature Measurements and Control Using Telegan Equipment Namely:-

1) Thermonitor Type, TM 1000 - Range 0 - 250^{o}C infrared contactless thermometer

2) Panel Mounted Controller/Data Logger

(iv) Sample Weighing

The simplest form being to weigh any sample before and after a cycle of sample testing. No modification is, therefore, necessary and this has been agreed with Dr R J Shuford in a recent discussion.

(v) Computer Control of Elastomer Test Machine

A permanently associated computer system is now installed with the ETM, namely, a Uiglen Personal Computer (VPC) which is an IBM clone, fitted with an 'IEEE' general purpose input bus (GPIB). The VPC, controls starting and stopping of the ETM; collects data from upto three load cells and records the temperature of the sample material. A 'BASIC' program has been written to accept the raw data coming from the ETM. A 'Turbo Pascal' program has been constructed to process these data and plot the corresponding graphs.

vi) Dr Shuford recently has suggested that it would be useful to provide the ETM with a new mode of operation in which the linear stage can operate with the press tool embedded and static in the sample. We have agreed to provide this modification within the existing contract and work is in hand in this respect.

Summary

The foregoing modification programme is well under way, i.e.

1) Machining of new components has commenced

2) All electrical/pneumatic components are now either ordered or awaiting quotation.

One additional item has also been incoporated in order to conform to the Health & Safety At Work Act (1974) namely that the air press

control system have had a safety modification kit installed to the makers instructions.

This brings the press up to present safety standards of the U.K.

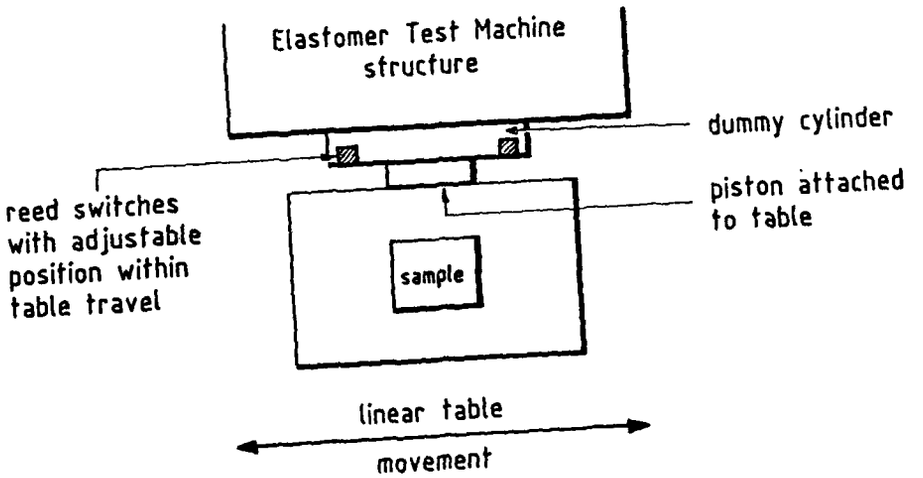
Elastomer Test Machine
structure
dummy cylinder
piston attached
to table
reed switches
with adjustable
position within
table travel
sample
linear table
movement

Fig. 1.

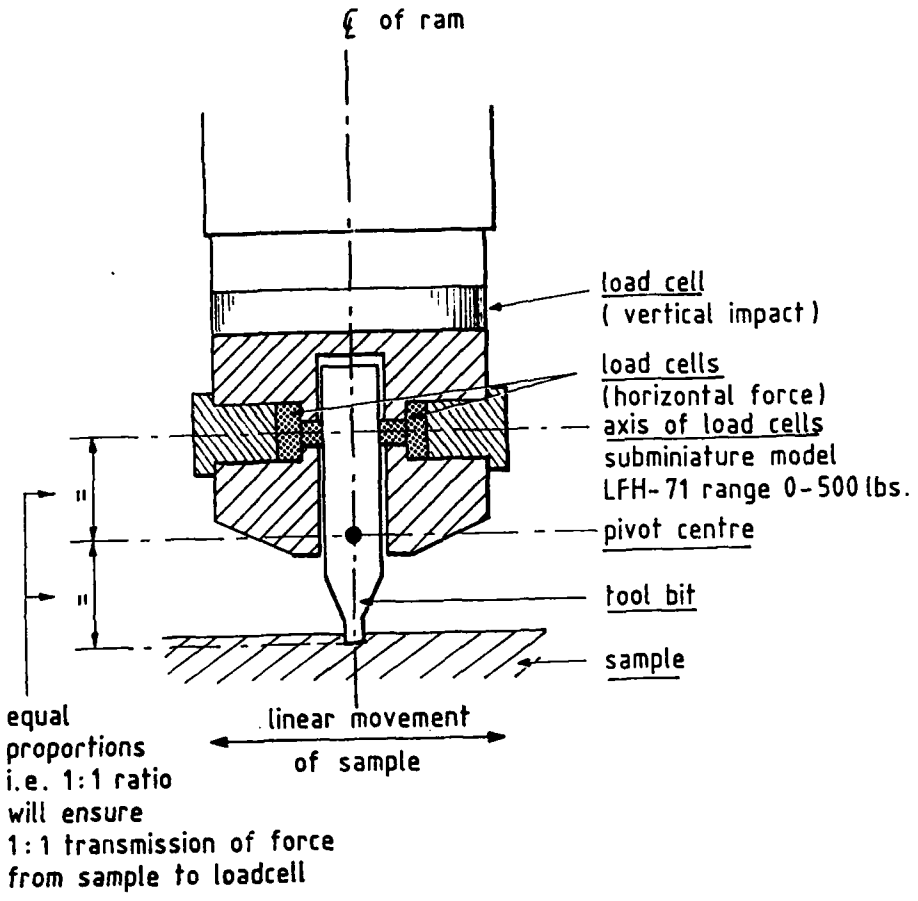
℄ of ram
load cell
(vertical impact)
load cells
(horizontal force)
axis of load cells
subminiature model
LFH-71 range 0-500 lbs.
pivot centre
tool bit
sample
equal
proportions
i.e. 1:1 ratio
will ensure
1:1 transmission of force
from sample to loadcell
linear movement
of sample

Fig. 2.